

# Growing gladiolus



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# Growing gladiolus

W. C. Lin

Saanichton Research and Plant Quarantine Station, Sidney, British Columbia

## INTRODUCTION

The gladiolus has few equals. It is highly appealing because the cut flowers are of excellent quality, they are used widely in exhibitions, and they have an attractive range of colors. It is especially valuable because it is adaptable to our widely varied climate and kinds of soil.

The gladiolus ranks tenth in cut-flower production in Canada. Ontario produces about a million spikes for sale each year; Quebec and other provinces produce about one quarter of a million. In addition, home gardeners grow thousands of gladiolus annually.

For best results, the following instructions are recommended:

- Plant in fertile, well-drained soil in full sun.
- Keep the plants well watered during the growing season.
- Keep the corms and plants free from insects and diseases.
- Cure freshly dug corms, apply a fungicide-insecticide mixture to them, and store them properly.
- In the Prairie Provinces and in other areas where the growing season is short, choose very early to midseason varieties, or sprout corms indoors before planting.

Several insects and diseases can damage gladiolus seriously unless they are controlled. The gladiolus thrips, one of the most common and widespread insect pests, winters on the corms and can ruin the flowers as well as make the leaves unsightly. For best control, treat the corms and the plants before they flower.

To prevent or control diseases that attack the corms or leaves, keep the planting free from weeds, rotate your crops, spray the plants, and cull and treat the corms. Destroy virus-infected plants; there is no cure.

Consult your provincial agricultural specialist about the need for use of pesticides and recommended control measures.

## CULTURE

### Planting

#### Site

The gladiolus is a sun-loving plant. Choose a site in full light with plenty of moisture and some protection from strong winds. In shade, the plants become leggy and do not flower well. Gladiolus can tolerate high temperature and high light intensity, but blind plants and reduced floral bud count occur under short-day, low-light intensity and cool night temperatures.

## Soil

Friable loam and sandy loam soils 20–25 cm deep are best; clays are satisfactory only when well aerated and adequately drained. You can improve clay soils by adding to them organic matter such as peat, compost, or well-rotted manure. Work it in thoroughly several months before planting. A slightly acid soil (pH 6.0–6.5) is preferred.

## Fertilizer

Fertilizer requirements vary with climate condition, irrigation method, and soil type. In sandy soil, it is necessary to provide fertilizer frequently. In some heavier loam soils, little fertilizer is needed.

To have vigorous, healthy plants, you need to use fertilizer on most soils. Two applications are usually enough, one just before planting and the other in early summer when the first flower buds appear. A soil test by your provincial ministry of agriculture is your best guide to the amount and kind of fertilizer to use.

Apply fertilizer by digging it into the row or banding it a few centimetres below and to the side of the corms. Too much will burn the roots. If you broadcast the fertilizer, you must use more than you would with the row method.

## Corms and cormels

Corms and cormels are the underground parts of the plant that reproduce it exactly. A corm is often incorrectly called a “bulb.” The cormels, or “bulblets,” are attached to the base of the new corm and above the old one (Fig. 1). The gladiolus corms are propagated from cormels.



Fig. 1 New corm with old corm and cormels attached at the base.

## Sizes

Corms are graded by the diameter: large, over 4 cm; medium, 3–4 cm; and small, 1–3 cm. Large corms are best for exhibition blooms and earliest flowering. The medium ones produce excellent flowering spikes, but the blooms are somewhat smaller and appear several days later. Small corms have the best chance of survival where the growing season is long or when they get special starting care; most flower the first year and produce mainly medium-sized corms along with a few large ones. Cormels normally need a full growing season to become small corms. In long-season areas, planting a series of sizes at 10-day intervals gives a succession of bloom.

## Depth and spacing

Plant the corms 8–13 cm deep, depending on their size and the texture of the soil. Plant deepest in dry, light-textured soils or where the plants may topple in the wind or loose soil.

Space the corms 10–15 cm apart in furrows of two or more rows, and 3–5 cm apart in single-row furrows. Space the furrows far enough apart to allow you to look after the plants easily, including cultivating, watering, cutting the flowers, and digging the corms.

## Summer care

### Watering

For first-grade flowers and an adequate yield of corms, the plants need plenty of moisture, especially from the time of shoot emergence to the two-leaf stage, which is approximately the time of flower-bud initiation. When necessary, irrigate every 10–14 days to a depth of 30 cm; check the depth with a soil auger or shovel.

### Mulching

Mulching helps to conserve water. You may use chopped straw, dried grass clippings, sawdust, horticultural peat, or flax shive.

A mulch is effective and satisfactory if it can meet the following conditions:

- It can keep the soil moisture in. This depends on how fine, compact, and deep the mulch is. Sawdust must be 5–10 cm deep.
- The soil is moist and can hold water. If the soil is dry before mulching, and there is little rain and you do not irrigate, then a mulch is useless.
- It can be disposed of in the fall. Work it into the soil if you use a small amount of organic material, 1–3 cm. Burn or remove the large amounts because they can cause a serious imbalance of nutrients if they are worked into the soil.

### Supporting the flowers

Large plants need support, particularly if you plan to exhibit them. Bamboo stakes and plant ties are ideal.

## Cutting and storing the flowers

Be careful not to damage the plants when cutting the flowers. With a little practice, the following method is easy and fast. Insert the sharp point of a thin-bladed knife into the stem of the spike (through the protecting leaves), just puncturing it. With the thumb opposite and above the knife, bend the stem quickly towards the knife, and twist the spike to break it.

If you remove the leaves when cutting the flowers the new corms will be smaller than if you do not, but you cannot help removing some leaves with long-stemmed flowers. To produce corms only, therefore, cut the flower heads as soon as the spikes emerge from the sheaths, especially with midseason and late varieties.

For immediate use, cut the flowers just as the first florets are opening. It is best to cut them in the early morning, when they are moist and fresh. But if the stems break easily and you must handle large quantities, it is better to delay cutting until the petals begin to flag. Slightly wilted flowers recover quickly when placed in water at room temperature and last just as long as fresh ones. But avoid cutting severely wilted flowers.

The cut flowers are stored best at 4–6°C. But store them no longer than a week so that they will be attractive at room temperature for several days. Flower life can be extended by 3–5 days with the use of a floral preservative containing sugars and bactericide. Water quality is important also and should be low in soluble salts and free of dissolved fluorides.

## Fall and winter care

### Harvesting

Harvest the corms 6–8 weeks after flowering or during the first 2 weeks of October. You gain little by delaying digging beyond this time, even in areas with long frost-free periods. If possible, choose a sunny day, and dig only what you can top and partly dry outdoors before nightfall. Remove the stem and leaves flush with the top of each corm with a sharp knife or secateurs.

### Curing and cleaning

Adequate curing is the key to storing corms successfully. Perhaps nowhere in Canada is curing more vital than along the Pacific coast, where the weather is extremely humid at digging time. But even in rather dry areas it is best to cure the corms before you store them.

For curing, place the corms in slatted or screened shallow trays and hold them for 1–2 weeks in a room where you can control the temperature, humidity, and ventilation fairly well. As a rule, it is best to keep them at 27°C. At 32–35°C they cure better and more rapidly, but the cost is higher. At 21°C they dry too slowly to retard storage rots. Any condition of curing that increases corm drying tends to retard the emergence of plants and to reduce the number of early flowers. When the new corm separates easily from the old one, curing is nearly complete and you should begin cleaning. Further curing only makes the corms harder to separate.

To clean the corms, remove the old ones and any soil attached to them. Peeling or removing the corm husks is not necessary but it helps in finding diseased corms. Immediately after cleaning, dust the corms thoroughly with a fungicide-insecticide mixture to control storage diseases and insects, especially thrips. Curing is complete when the cleaned corms have had 3-7 more days at 27°C. This produces callouses on the bases to make the corms more resistant to diseases.

## Storing

Corms dug in the warm months require 3-4 months of cold storage at 2-4°C to break dormancy. Store the corms at that temperature in thin layers in shallow trays, preferably with wire bottoms. Check them from time to time for storage diseases and excess moisture. If they look moist, warm the room with an electric fan-type heater and open the air vents or windows for several hours or days.

## Classes and terms

The Canadian Gladiolus Society classifies flowers by a three-digit system. The first digit indicates floret size, the second digit basic color, and the third digit depth of color. The blooming season is indicated by abbreviations: V.E., very early; E., early; E.M., early midseason; L.M., late midseason; L., late. Highly rated varieties are listed each year in the *Annual* of the Society. Copies may be obtained from the membership secretary.

In addition to the regular large- and giant-flowered gladiolus that are so well known, the small-flowered types are becoming increasingly popular. They are well suited to today's smaller gardens, and flower arrangers are finding that the delicate blooms blend better with other flowers.

Gladiolus flowers are often described by their shape or color pattern. Some of the common terms are as follows:

**blotch** A lighter or darker color making a heart-shaped pattern on the lower, inner petal edges or throat.

**feathered** Having lines of color contrasting delicately with the underlying petal color.

**needlepoint** The tips of the petals extended to form a prominent, sharply tapering point.

**ruffled** Having the petal edges crimped or folded.

## Growing for exhibition

If blooms are grown for exhibition at local shows, top-quality flowers are desired. Several factors have to be considered from the time the corms are planted. Soil should be deep and well drained. Use large corms at best age to obtain the best blooms for a given variety. Plant top-quality corms 25-40 cm apart, and use adequate water and appropriate fertilizer. Plants should be upright during the growing season; when the spikes show through the plant, staking is advisable, especially in a windy location.

Flowers can normally be harvested in 60–100 days, depending on the variety and weather conditions. Plant late varieties very early (or sprout the corms indoors before planting) and others on two or three planting dates with 10-day intervals. Gladiolus blooms are usually harvested with the lowest one or two florets open. After cutting the flowers, place them in fresh water about 10 cm deep and put them in a cool place. The spike will open to its maximum in 2–3 days. If the blooms come out too early for a show, you can hold the flowers in cold storage at 4–6°C.

Florets should all face one way and be regularly placed. As soon as the spike has developed, some exhibitors start “training” their spikes to make sure that the florets, when open, will be placed correctly and will face the proper direction. To adjust the florets, insert cotton wads between the base of the floret and the stem. Carry the spikes to the show very carefully, preferably in an upright position to prevent distortion of the stems. It is important not to bruise any petals.

At the show, remove all cotton wads and make a final adjustment to the florets. It is important to make sure the specimen is entered in the right class. The North American Gladiolus Council has published judging standards for gladiolus. Gladiolus are classified into five groups based on the size of the first or lower floret. Each group of gladiolus must meet certain specifications. Exhibitors can enter single-spike, three-spike, or five-spike competitions. For a summary of these standards, please refer to Agriculture Canada Publication 1395, *Judging Standards for Horticultural Shows*. Join or consult with the Canadian Gladiolus Society for information on exhibitions, and become familiar with the values used on the judges’ scoring sheets.

## INSECTS AND MITES<sup>1</sup>

Aphids and gladiolus thrips are the insects that are most damaging to gladiolus. The two-spotted spider mite and wireworms are also common.

### Aphids

The main species of aphids that cause damage or spread virus diseases are as follows: bean aphid, green peach aphid, tulip bulb aphid, melon aphid, and potato aphid.

They injure gladiolus in several ways. As they feed, they suck a great deal of sap. This produces misshapen or discolored leaves or flowers and slows the growth of the plants. Disease organisms may get into the plants through the wounds. The aphids spread virus diseases as they feed; for example, the melon aphid spreads cucumber mosaic virus. Also, they secrete a sticky fluid called honeydew over the leaves. A sooty mold develops on the honeydew and spoils the appearance of the plants.

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<sup>1</sup> Prepared by N.V. Tonks and H. Andison (both retired), Saanichton Research and Plant Quarantine Station, Sidney, B.C.

## Description and life history

Aphids are small, soft-bodied insects. They are green, reddish brown, or black and have rather long legs. During the growing season, practically all of them are females. They mature in 1–3 weeks and give birth to young aphids at a rapid rate. From time to time during the growing season, some of the recently born aphids develop wings at maturity (depending on the species) and fly to other plants.

## Control

Because aphids multiply rapidly, spray or dust with an insecticide as soon as possible after you see them on your plants. When breeding gladiolus, isolate your seedling plantings and spray them regularly, beginning as soon as the plants emerge. To control the bulb aphid, use a dust when storing the corms. Consult your provincial agricultural specialist for recommended sprays and dusts.

## Gladiolus thrips

Both larval and adult thrips rasp the foliage and cause whitish streaks, or “silvering,” on the leaves and flower buds. The flowers are also streaked and do not open or develop normally. The thrips also thrive on the corms in storage.

## Description and life history

The adults, almost invisible to the naked eye, are dark brown and have two pairs of delicate, fringed wings. They lay their tiny eggs on the tissues of various parts of the plants. The young feed in the leaf sheaths and flower buds, and the adults feed mainly on the exposed surfaces. The insects breed throughout the growing season, and under favorable conditions may produce a new generation every 2 weeks. The adults are not known to overwinter outdoors in Canada.

## Control

For best control, treat the corms either just before you store them or before you plant them. Because adults may fly into your plantings, you must dust or spray the plants in the spring and summer before the flowers appear.

### Treating the corms before storing

After you cure and clean the corms, dust them with an insecticide recommended by your provincial agricultural specialist. You do not need to peel the corms or store them in closed containers. Leave them in open trays for at least a month after dusting. If cold-storage facilities are available, store the corms at 2°C for 2 months or at 4°C for 3 months to kill the thrips at all stages.

### Treating the corms before planting

If you did not treat the corms before storing them, dip them in Lysol® before you plant them. Use 60 mL in 14 L of water and soak the corms (peeled or unpeeled) for 3 hours. Plant them immediately. The dip kills the thrips at all stages.

and does not delay growth of the plants or flowers. To control diseases as well, add a fungicide recommended by your provincial agricultural specialist.

### Treating the plants

To control thrips that may fly in from neighboring plantings, dust or spray the plants. Because the foliage is difficult to wet, add an appropriate spreader-sticker to the spray.

Treat the plants three times before they bloom. Start when they are 15 cm high and repeat at 10-day intervals. If the plants need water, apply it first, and let the leaves dry before you apply the insecticide.

## Two-spotted spider mite

This mite does most of its damage in hot, dry weather. Both the young and adults suck the juices from the foliage, causing a fine whitish or yellowish speckling. The leaves look pale and unhealthy. They later turn brown and are covered with fine, silken webs.

### Description and life history

The mites overwinter as adults on plants and trash on the ground. The adults are bright orange, but during most of the season the mites are pale greenish yellow and have two conspicuous dark spots on their backs. They are almost invisible to the naked eye, and groups look like moving dots on the leaves under their webs. There are several generations a year, the greatest numbers usually occurring in August and September when it is dry and hot.

### Control

Ask your provincial agricultural specialist about sprays for controlling mites.

## Wireworms

Two species of wireworms commonly damage gladiolus. The larvae tunnel into the corms and the newly developing foliage just below the soil surface.

### Description and life history

The adults, or click beetles, emerge from the soil early in the spring and lay their eggs in sod. The larvae are six-legged, slender, tough, yellowish or reddish brown, and about 3 cm long. They live in the soil for several years, feeding on the roots of plants. When mature, they pupate in the soil and the adults emerge the next spring.

### Control

If you have a wireworm problem, consult your local agricultural specialist for advice.

## Bulb mite

The bulb mite is a problem only if your planting is infected with scab. For directions on control, see section entitled "Scab."

## WEEDS<sup>2</sup>

It is important to control weeds in gladiolus in order to conserve moisture and plant nutrients. Certain chemical sprays are safe and are widely used, but most of them are effective only against annual weeds. Therefore, do not plant gladiolus where perennial weeds are a problem.

Some herbicides kill germinating weed seeds in the surface layer of soil and keep the planting free from weeds for most of the season. But the soil must be moist enough for the herbicide to penetrate into the upper layer. If the surface is dry, apply 1 cm of water by sprinkler irrigation before or immediately after you treat the soil. Be sure to apply herbicides before the weeds emerge, because most of them have little effect on the weed leaves.

## What to use

In selecting a herbicide, consider the following:

- How long the control needs to last.
- Kinds of weeds in the planting.
- Stage of growth of both the weeds and the gladiolus.
- Cost of the treatment.

No one chemical can be used universally, because most herbicides are specific for soil types and prevalent weed population. Consult your nearest provincial agricultural office for the treatment recommended in your area. The rate depends on the type of soil and its organic matter content. Use a lower rate on sandy soils and a higher rate on loam or clay soils or on those with a high level of organic matter. Most recommendations by provincial ministries of agriculture are given in weight of the active ingredient per 100m<sup>2</sup>. To find the amount of a product needed for each tank of spray, follow the directions on the label.

## Applying the herbicide

To be effective, the herbicide must be applied at the proper time, uniformly, and at the recommended rate. Too much may injure the crop; too little may not control the weeds.

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<sup>2</sup> Prepared by R.M. Adamson (retired), Saanichton Research and Plant Quarantine Station, Sidney, B.C.

Consider these points when applying the spray:

- Use a well-made nozzle with a medium-size fan-type opening.
- Walk at a steady pace.
- Keep the nozzle at a fixed distance from the ground.
- Pump regularly to keep the pressure nearly uniform.
- Agitate the mixture while spraying because some herbicides, especially wettable powders, settle quickly.
- Check the nozzle occasionally to see that the screen is not plugged.

## DISEASES<sup>3</sup>

Diseases caused by fungi, bacteria, and viruses cause heavy annual losses to commercial growers and disappointment to many amateur growers. Most of the diseases have readily recognizable symptoms on the growing plants, on the corms, or on both.

### General control measures

You can control or eliminate most gladiolus diseases by following suitable cultural practices and, when necessary, by using chemicals.

#### Cultural practices

- Examine the corms before planting them and destroy those that show signs of disease.
- Treat corms with a recommended fungicide.
- Plant corms in full sun in well-drained soil where the aeration is good.
- Grow gladiolus on the same soil not more than once in 4 years, preferably less frequently, because of disease organisms that may survive in the soil. If this is not possible, treat the soil with a suitable chemical, and then plant only disease-free corms.
- Cut flower spikes and work among the plants only when they are dry. Dip the knife in rubbing alcohol or equivalent disinfectant often when you are cutting spikes and corms.
- Irrigate by soaker hose or ditch if possible, to avoid wetting the foliage. In order to reduce the danger of spreading bacteria when you must irrigate by sprinkler, use a fine spray and water only during the morning hours before sunrise, when the leaf pores are closed.
- Cure and clean the corms thoroughly immediately after harvesting them.
- Remove volunteer plants.
- Remove and destroy diseased plants when you notice them in your planting.

<sup>3</sup> Revised by R.O. Magie, Agricultural Research and Education Center, Bradenton, FL, USA, and J.H. Crossley (retired), Saanichton Research and Plant Quarantine Station, Sidney, B.C.

## Preplanting treatments

### Treating the corms

Treat the corms after harvest, preferably, because disease control is more effective then, particularly against storage diseases such as fusarium dry rot (see section entitled "After-harvest treatments"). If all corms and cormels are not treated after harvest, they should be dusted or soaked in a recommended fungicide before planting. Consult your provincial agricultural specialist.

When using a soak, place the corms and cormels in the fungicide solution for 5–30 minutes. Agitate to keep the powder from settling. When using a dust, apply it out of doors by rolling the corms in a closed drum or bag that contains slightly more dust than you need. Then place the corms on a screen to remove the excess dust before handling them.

### Treating the soil

If disease has been common in your gladiolus, and you must plant them in the same soil every year, apply an insecticide as well as a fungicide.

If wireworms are a problem, consult your provincial agricultural specialist for control measures (see the section entitled "Wireworms").

Soil fumigants may be used to control gladiolus diseases. Consult your provincial specialist concerning soil fumigants, how to apply them, and how long you must wait before planting.

If dry rot is the only problem, good control may be obtained by applying a fungicide. Consult your provincial agricultural specialist for a fungicide recommended for your area and check the rate of application. You should till the soil thoroughly to mix the fungicide in the top 15 cm.

### Foliar sprays

Spray with a fungicide every 10 days from the time the plants are 15 cm high until the buds show color. Spray after flowering if needed. If the liquid does not stick to the leaves, add an appropriate spreader-sticker.

### After-harvest treatments

To control diseases more effectively, treat the freshly cleaned corms in the fall rather than just before planting; this applies particularly to storage diseases such as fusarium dry rot. The after-harvest treatment usually takes the place of the preplanting treatment. Be sure to wash the dirt off the corms as soon as they are harvested. Washing should be followed by treatment, then curing for 10–14 days at 29–32°C. Consult your provincial agricultural specialist for recommended treatment.

## Diseases caused by bacteria and fungi

### Scab

Scab, also known as neck rot and stem rot, is one of the most common diseases of gladiolus. It disfigures the corms and makes them unfit for sale. The organism can survive in the soil for at least a year and can persist indefinitely on infected volunteer plants. The disease is particularly troublesome on clayey, poorly drained soils.

#### Injury

On the corms the diseased areas are brownish, sunken, and mainly circular with raised edges. A hard, varnish-like material covers them. During wet weather, especially in wet soils, the disease may infect the stem of the plant near the soil surface and extend up the plant for several centimetres. Small brownish yellow spots develop on the leaves. These spots become enlarged and grow together to form elongate dead areas.

#### Control

See section entitled "Cultural practices." Be sure to discard all infected corms because chemical treatments are not effective when the corms are heavily infected.

### Botrytis disease

Botrytis disease is common in British Columbia and is most severe when the humidity is high. When infected corms are planted, they decay or produce weak, yellowed shoots that soon die. Corms become infected by spores from leaves, not from residue of a previous crop.

#### Injury

On the stem, the disease starts near the soil surface and causes a brown to gray black, rotted girdle. Infected leaves turn yellow from the tips downward and die. In cool, humid weather, distinctive gray spores form on the rotted areas and are blown to other plants. As the underground tissues rot, only the tough fibers are left, and the stem appears shredded. Large resting bodies of the fungus may form on the badly rotted stem.

On the leaves, germinating spores cause small, round, reddish brown to rust spots. As the spots become enlarged, several may join to form large discolored areas, which are mainly yellow brown with light brown centers. In humid weather, masses of distinctive gray spores develop on them.

On the flowers, brown areas may develop, making them unfit for sale.

On the corms, the symptoms differ depending on where the disease begins. Surface infections are circular and sunken, with mainly straw-colored centers and reddish brown to dark brown edges. When the infection is stopped, the affected areas become brown and firm. Infections that start at the stem end or the base of the corm cause the corm to rot. The rot may extend to the surface. If it is stopped before reaching the surface, the core may fall out or disintegrate, leaving a doughnut-like corm.

Infected corms continue to decay in cold storage, even if they are properly cured. The whole corm may become soft, spongy, and dark brown. Rotting of infected corms may be avoided if they are stored at temperatures above 13°C. The corm tends to wall off infection at higher temperatures.

#### Control

See section entitled "Cultural practices." The disease develops rapidly when the air is moist and cool. Under all conditions, be sure to remove all diseased plants or cut off the affected parts promptly to keep the disease from spreading. The corms may be soaked in a fungicide solution before you plant them. In areas where botrytis disease is a recurring problem, use a foliage spray recommended by your provincial agricultural specialist.

### Dry rot

Dry rot is a widespread disease of gladiolus. It attacks plants in the field and corms in storage, causing heavy losses, especially near the Pacific coast. In the field, dry rot is more serious in wet seasons than in dry ones.

#### Injury

The most typical symptoms occur on the leaves of growing plants. The leaves near the soil surface are affected first. They turn yellow from the tip downward, and the sheaths and stem turn brown to black. Later the sheaths become shredded and covered with many round, black resting bodies just large enough to see. These tiny bodies and the absence of masses of gray spores distinguish the disease from the stem rot of botrytis disease.

On the corms, the rot appears first as very small distinctive reddish brown spots. These later become dry and dark brown to black, have slightly raised edges, and range in size from a pinpoint to 6 mm. Several spots may join to form irregular-shaped areas. The spots are common along the node lines, usually on the top side. When infected corms are planted or stored, the decay spreads to the inside and eventually makes them hard and black.

Planting lightly infected corms in clean soil introduces the fungus. It may persist in the soil for several years, even in the absence of gladiolus.

#### Control

See section entitled "Cultural practices." Eliminate all infected corms to prevent the disease from getting into clean soil. If your soil is infested, treat it chemically or do not plant gladiolus for 4 or 5 years. Consult your provincial agricultural specialist concerning chemicals for treating the soil. To prevent a new infection, use a corm soak or dust treatment as recommended by your provincial specialist.

### Fusarium yellows

Fusarium yellows is caused by a fungus that can live in the soil for many years. It is favored by high soil temperature and low moisture. It is mainly a field disease, but corms infected in the field may continue to decay in storage.

## Injury

The symptoms first appear with the onset of hot weather. Affected plants stop growing and are noticeably dwarfed. The leaves turn yellow, starting in one part such as the tips or sides. Later they turn brown and die. There are no blackened areas at the bases of the leaves.

The corms become infected from diseased roots, which may be only slightly browned or completely decayed. Infected corms have brown rot at their bases. The cores are also brown, and streaks radiate into the surrounding tissue. The corms may eventually rot completely.

## Control

To be most effective, several control measures should be carried out, including hot-water treatment of the cormels, chemical treatment of corms, and reduction of soil infestation by a 6- to 10-year rotation or by soil fumigation. For corms, use a soak or dust as a preplanting treatment. Consult your provincial agricultural specialist for a chemical to use in your area. For cormels, the treatment that follows is effective.

Dig the cormels early, hold them at room temperature (18–23°C) for 8–10 weeks, soak them in water for a day, and discard those that float. Then place the good cormels (sinkers) for 30 minutes in water held at 56°C, to which a fungicide has been added. Consult your provincial specialist for a recommended fungicide. Agitate the solution while maintaining the temperature for the full 30 minutes. Dry the cormels and hold them in cool storage (2–4°C) until about 2 weeks before planting. If the cormels are soaked in water before planting, treat them again with a fungicide.

## Penicillium rot

Penicillium rot injures mainly corms in storage. The fungus gets in through wounds, either in the field or in storage. The disease is serious only when the corms are not properly cured.

## Injury

Damaged areas on the corms are reddish brown, sunken, irregular, and shriveled. In moist air, masses of blue green spores grow on the surface. Light brown or buff resting bodies of the fungus may develop in the tissues. As the moist decay extends into the corms, it may destroy them.

## Control

See section entitled “Cultural practices.” Be careful not to injure the corms when you harvest and clean them. Cure them quickly to keep the disease from spreading. Before storing the corms, dust them with a fungicide recommended by your provincial agricultural specialist.

## Stemphylium leaf blight

Stemphylium leaf blight occasionally attacks gladiolus in British Columbia. It is most common during humid weather and most destructive at flowering time.

### **Injury**

The disease causes small, round, translucent, pale yellow spots on the leaves. The centers of the spots become red to reddish brown, giving the disease the alternative name "red spot." Heavily infected leaves make the plants stunted and the corms small.

### **Control**

If the disease is troublesome, treat the plants with a foliage spray.

## **Virus diseases**

Diseases caused by viruses are becoming more and more common, both in Canadian-grown and in imported corms. The symptoms are often confused with those caused by a lack of nutrients or by insects such as thrips. Mild symptoms may often seem unimportant. By watching diseased plants for several years, you will see the quality and vigor deteriorate. The infection may spread until all your plants are diseased.

### **Injury**

Virus diseases may cause yellowish white mottles or streaks on the leaves, or whitish streaks or blotches on the petals. They may turn the leaves bronze or yellow and the flower buds and petals greenish. The leaves may be "grassy" and the plants may fail to bloom. The viruses that cause these symptoms are spread by insects from other gladiolus or from unrelated plants. Usually no symptoms are visible on diseased corms.

### **Control**

Destroy plants that show any of the above symptoms if you do not see fungus diseases or insect pests on them, because virus-infected plants cannot be cured. Be sure to control aphids and leafhoppers to keep them from spreading the diseases. Because some viruses affecting gladiolus, particularly bean yellow mosaic and tobacco ringspot, may be spread by tools used for cutting flowers, after each cut, dip the tool into a sterilizing solution such as a 10% solution of trisodium orthophosphate or 25% methyl alcohol. Keeping your planting free from weeds also helps to control virus diseases.

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## SCIENTIFIC NAMES OF ORGANISMS

### Insects and mites

Bean aphid	<i>Aphis fabae</i> Scopoli
Bulb mite	<i>Rhizoglyphus echinopus</i> (Fumouze & Robin)
Gladiolus thrips	<i>Taeniothrips simplex</i> (Morison)
Green peach aphid	<i>Myzus persicae</i> (Sulzer)
Melon aphid	<i>Aphis gossypii</i> Glover
Potato aphid	<i>Macrosiphum euphorbiae</i> (Thomas)
Tulip bulb aphid	<i>Dysaphis tulipae</i> (Fonscolombe)
Two-spotted spider mite	<i>Tetranychus urticae</i> Koch ( <i>T. telarius</i> of authors)
Wireworms	<i>Agriotes sparsus</i> LeConte
	<i>Ctenicera aeripennis</i> (Kirby)

### Diseases

Botrytis disease	<i>Botrytis gladiolorum</i> Timmerm.
Dry rot	<i>Stromatinia gladioli</i> (Drayton) Whet.
Fusarium yellows	<i>Fusarium oxysporum</i> Schlecht. f. sp. <i>gladioli</i> (Massey) Snyd. & Hans.
Penicillium rot	<i>Penicillium gladioli</i> McCull. & Thom
Scab	<i>Pseudomonas marginata</i> (McCull.) Stapp
Stemphylium leaf blight	<i>Stemphylium</i> sp.

### CONVERSION FACTORS

Metric units	Approximate conversion factors	Results in:
<b>LINEAR</b>		
millimetre (mm)	x 0.04	inch
centimetre (cm)	x 0.39	inch
metre (m)	x 3.28	feet
kilometre (km)	x 0.62	mile
<b>AREA</b>		
square centimetre (cm <sup>2</sup> )	x 0.15	square inch
square metre (m <sup>2</sup> )	x 1.2	square yard
square kilometre (km <sup>2</sup> )	x 0.39	square mile
hectare (ha)	x 2.5	acres
<b>VOLUME</b>		
cubic centimetre (cm <sup>3</sup> )	x 0.06	cubic inch
cubic metre (m <sup>3</sup> )	x 35.31	cubic feet
	x 1.31	cubic yard
<b>CAPACITY</b>		
litre (L)	x 0.035	cubic feet
hectolitre (hL)	x 22	gallons
	x 2.5	bushels
<b>WEIGHT</b>		
gram (g)	x 0.04	oz avdp
kilogram (kg)	x 2.2	lb avdp
tonne (t)	x 1.1	short ton
<b>AGRICULTURAL</b>		
litres per hectare (L/ha)	x 0.089	gallons per acre
	x 0.357	quarts per acre
	x 0.71	pints per acre
millilitres per hectare (mL/ha)	x 0.014	fl. oz per acre
tonnes per hectare (t/ha)	x 0.45	tons per acre
kilograms per hectare (kg/ha)	x 0.89	lb per acre
grams per hectare (g/ha)	x 0.014	oz avdp per acre
plants per hectare (plants/ha)	x 0.405	plants per acre





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